D101.22/3:385-63

SAFETY DIGEST

AMC Pamphlet
AMC 385-63

January
1965

UNIV. OF FLORIDA LIBS.
DOCUMENTS
DEPARTMENT
U.S. DEPOSITORY

UNIVERSITY OF FLORIDA LIBRARIES
FEB 5

UNITED STATES ARMY MATERIEL COMMAND
WASHINGTON, D.C. 20315

★★★★

AWARD
OF
HONOR
United States Army Materiel Command
FOR THE SECOND CONSECUTIVE TIME
AN OUTSTANDING
SAFETY PERFORMANCE
FISCAL YEAR 1964

N.S.C. AWARD OF HONOR Presentation

GOVERNOR PYLE, PRESIDENT OF THE NATIONAL SAFETY COUNCIL, IS SHOWN PRESENTING THE NSC AWARD OF HONOR FOR SAFETY TO GENERAL BESSON FOR THE AMC FY 1964 SAFETY PROGRAM. THE CEREMONY WAS HELD IN BUILDING T-7, WASHINGTON, D. C.

THIS IS THE SECOND CONSECUTIVE NSC AWARD OF HONOR WON BY AMC IN THE FIRST TWO YEARS OF ITS EXISTENCE.

AMONG THOSE PRESENT WERE LT. GENERAL RICHARDSON, MAJ. GENERAL SEEDLOCK, MR. WILKENSON, DCSPER; AND MAJ. GENERAL SMITH, BRIG. GENERAL HARDAWAY, COL. D'AREZZO, MR. PRUETT AND MR. BISHOFF, AMC.

HEADQUARTERS
UNITED STATES ARMY MATERIEL COMMAND
WASHINGTON, D. C. 20315

AMC PAMPHLET
NUMBER 385-63

January 1965

The Safety Digest is an AMC Pamphlet prepared by the Safety Division, U. S. Army Materiel Command. Its purpose is to disseminate information which can materially influence and improve safety programs at all Command establishments.

Articles are included to supplement technical knowledge as well as practical knowledge gained through experience. They provide a basis for the further refinement of safety measures already incorporated in operating procedures and process layout. To achieve maximum effectiveness, the Safety Digest should be given widespread circulation at each AMC establishment.

Articles appearing in the Safety Digest are unclassified and are not copyrighted. They may be reproduced as desired in order to bring pertinent accident prevention information to the attention of all employees. The Army Materiel Command Safety Digest should be given a credit line when articles are extracted.

Unclassified materiel believed to be of interest or benefit to other establishments is welcome for publication in the Safety Digest. Please send articles for review to: U. S. Army Materiel Command Field Safety Agency, Charlestown, Indiana. If possible, include pictures, charts, drawings, and illustrations that clarify and heighten interest in your presentation.

(AMCAD-S)

FOR THE COMMANDER:

SELWYN D. SMITH, JR.
Major General, USA
Chief of Staff

OFFICIAL:

Stanley J. Sawicki

STANLEY J. SAWICKI
Colonel, GS
Chief, Administrative Office

DISTRIBUTION:
Special

I

IN THIS ISSUE

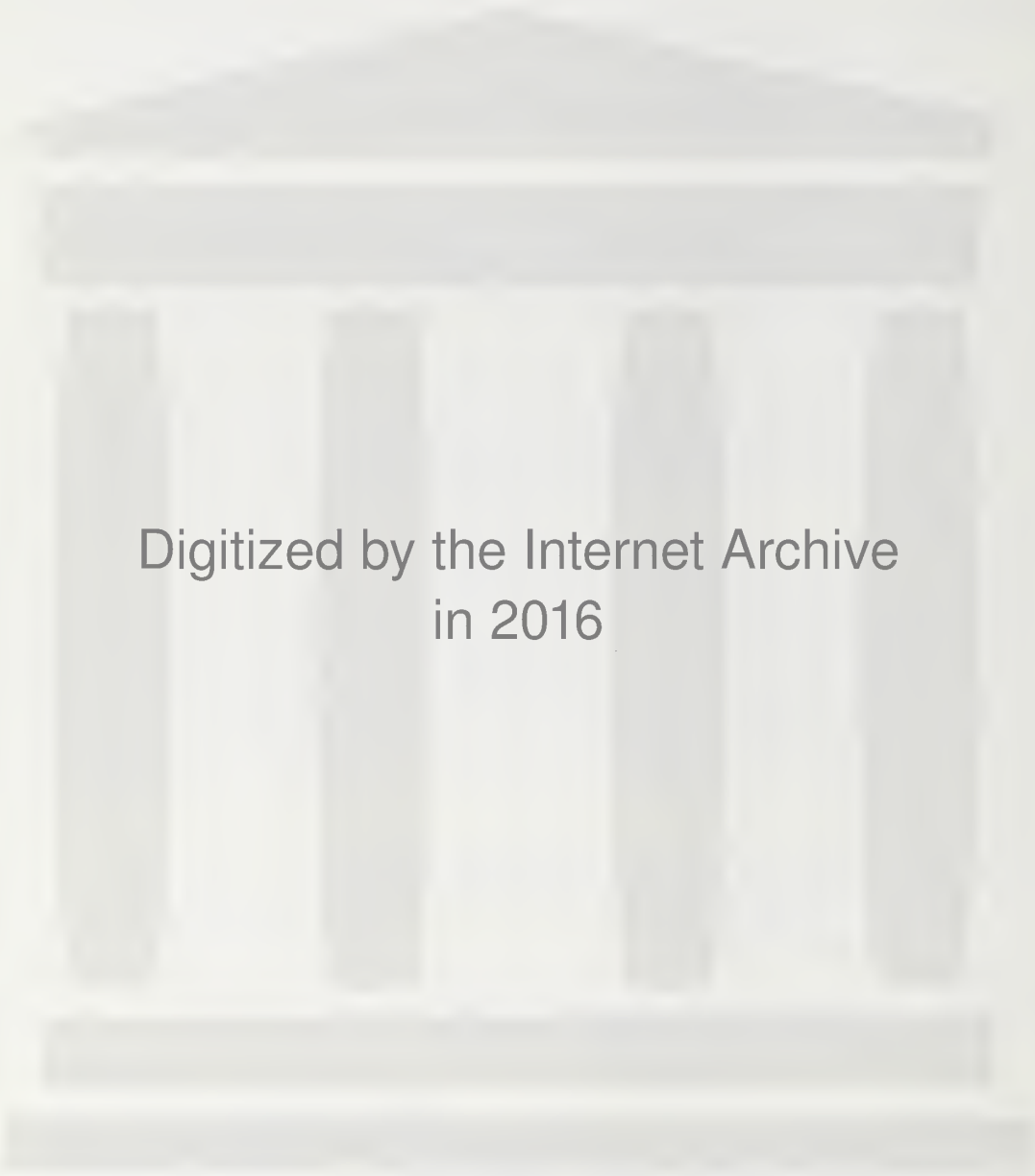
FOREWORD I
IN THIS ISSUE II

THE ARMY MATERIEL COMMAND WINS THE NATIONAL SAFETY COUNCIL AWARD OF HONOR 1
OTHER SAFETY AWARDS 2
PORTAGE COUNTY, OHIO, SAFETY AWARD WON BY RAVENNA ARSENAL, INC. ... 3
WATERVLIET ARSENAL WINS NSC AWARD OF HONOR 3
EXTENSION COURSES IN SAFETY MANAGEMENT SUBJECTS 4
REFERENCE PUBLICATIONS 4
SAFETY BUILT INTO GAS DYNAMICS LABORATORY FACILITY 5
FLAMMABILITY OF VAPOR AND GASES 9
NEAR TRAGEDY WHEN CHEMOX RESPIRATOR IS MISUSED 12
SAFE MAINTENANCE AND INSPECTION OF TANKS 13
CURRENT EVENTS
- UNALIGNED ELEVATOR FLOOR COSTS FINGERS 18
- MAKESHIFT SCAFFOLDING SHEDS CARPENTERS 19
- POLICE MEET AND CRASH 19
- RUNAWAY CRANE TRAPS MAN AT TELEPHONE 20
- AN ASH TRAY FLASHES 21

AMC SAFETY SCHOOL GOES TO PUPILS 22
SPECIAL TYPE MACHINE GUARDING 23
EXPLOSIVES SAFETY
- LABORATORY OVEN SAFETY 24
- MAINTENANCE OPERATIONS AND EXPLOSIVES HAZARDS 27

WHAT TO WEAR AND WHEN TO WEAR IT 28
DRIVER ANALYSIS AND TRAINING 29
DO YOU KNOW? 31
NEW HELMET LINER PROTECTS COMBAT SOLDIER 33
WELL, DID YOU KNOW? 34

- FRONT COVER SHOWS AN ENTAC MISSILE READY FOR FIRING, AND AN/PRC RADIO BEING USED UNDER FIELD CONDITIONS
- REAR COVER SHOWS CV-7A CARIBOU



Digitized by the Internet Archive
in 2016

https://archive.org/details/safetydigest1965wash

THE ARMY MATERIEL COMMAND WINS THE NATIONAL SAFETY COUNCIL AWARD OF HONOR

The National Safety Council has approved the NSC Award of Honor for the Army Materiel Command. This is the second consecutive year that our Command has won this coveted safety award.

Accomplishment of this outstanding feat has been due to the safety efforts by all personnel of Subordinate Commands, installations, and activities. The National Safety Council has also approved awards to the following AMC Commands and installations.

AWARDS OF HONOR

Aeronautical Depot Maintenance Center
Cincinnati Procurement District
Fort Wingate Army Depot
Frankford Arsenal
Jefferson Proving Ground
Letterkenny Army Depot
Materials Research Command
Michigan Army Missile Plant
Savanna Army Depot
Sierra Army Depot
Springfield Armory
Tobyhanna Army Depot
U. S. Army Mobility Command
U. S. Army Weapons Command

AWARDS OF MERIT

Air Defense Board
Ammunition Procurement Supply Agency
Armor Board
Atlantic Terminal Command
Aviation Materiel Command
Ballistics Research Laboratories
Birmingham Procurement District
Cleveland Army Tank-Automotive Plant
Cleveland Procurement District
Chicago Procurement District
Detroit Procurement District
Electronics R & D Laboratories
Engineer R & D Laboratories
Erie Army Depot

Erie Proving Ground
Holston Army Ammunition Plant
Joliet Arsenal
Lima Army Modification Center
Longhorn Army Ammunition Plant
Missile Support Command
Mobility Equipment Center
Pueblo Army Depot
St. Louis Procurement District
San Francisco Procurement District
Sioux Army Depot
Tank-Automotive Center
Transportation Research Command
U. S. Army Munitions Command
Watervliet Arsenal

Awards are now being processed and will be forwarded directly from the Council. Appropriate award ceremonies and publicity should be arranged locally.

OTHER SAFETY AWARDS

The Directorate of Procurement and Production, U. S. Army Electronics Command has qualified for a National Safety Council Award of Merit for operating 1,412,344 manhours without a disabling injury from 1 May 1964 to 25 September 1964.

PORTAGE COUNTY, OHIO, SAFETY AWARD WON BY RAVENNA ARSENAL, INC

During the Arsenal's Eighth Annual Awards Banquet held 13 October 1964, Ravenna Arsenal, Inc., management and employees were presented the Portage County Group Safety Award, and the 100% Award for having worked 356,579 manhours in CY 1963 without a disabling injury. This was the eighth consecutive year that the Operating Contractor has earned the Group Safety Award. (The Group Safety Award is presented to the company with the best record in its employment group. The 100% Award is based on no disabling injuries in a calendar year.)

WATERVLIET ARSENAL WINS NSC AWARD OF HONOR

Watervliet Arsenal has received a bar to an earlier National Safety Council Award of Honor for compiling 3,709,942 manhours without a disabling injury. Shown (left to right) in the photo are Frank J. McGinnis, installation Safety Director; Col. Keith T. O'Keefe, Commanding Officer; and James R. Sampson, Army Weapons Command Safety Director. (Editors note: The National Safety Council also approved an Award of Merit (see list) for Watervliet FY 1964 safety program.)

EXTENSION COURSES IN SAFETY MANAGEMENT SUBJECTS

Special extension courses for safety management personnel at the entrance, intermediate, and senior levels were announced by The Adjutant General's School, United States Army, 1 July 1964. The basic purpose of these courses is to provide specialized training for employees in the Army Civilian Safety Management Career Program to better equip them to do their tasks and to assist them in preparing for positions of increased responsibility. Personnel other than those enrolled in the Army civilian career program for safety management may and are encouraged to enroll in the courses.

These courses are required of all personnel (reference CPR CP 12, 19 June 1964), unless the courses are waived (reference para 3-3.b. CPR CP 12, 19 June 1964). It would appear that a majority of personnel at the entrance and the intermediate levels especially should be enrolled in these courses.

Safety Directors are encouraged to discuss the extension course program with the safety personnel in their commands and to encourage maximum enrollment. They are also invited to encourage enrollment by civilian supervisors and by NCO's, warrant, and commissioned personnel who are assigned to safety program duties on a part- or a full-time basis.

REFERENCE PUBLICATIONS

AR 40-14, 21 October 1964
Control and Recording Procedures-Occupational Exposure to Ionizing Radiation

AMCR 385-9, 26 October 1964
Procedures to Obtain Authority to Possess, Use, and Transfer of Radioactive Material

AMCR 385-16, 10 November 1964
Safety - Bureau of Employees' Compensation and Army Civilian Injury Reports Recommendation (RCS CSGPA-836)

AMC Circular 715-12, 29 October 1964
Procurement - Contractor Reports - Authorized Data List (See Pages 1, 17, 28, 240 thru 251, and 379).

SAFETY BUILT INTO GAS DYNAMICS LABORATORY FACILITY

G. W. Lintner
Safety Officer, Rock Island Arsenal

Several years ago an experimental rocket launcher was caught in the back blast of a rocket that had just been fired from it and was flipped over backwards. The experience showed the need for a universal test facility that would produce a simulated blast on a small scale model and measure the load effect quickly and accurately at a near Mach 1 speed. The experience also resulted in emphasis on launcher stability and the effects of high velocity gases on muzzle brake structures and blast deflectors.

The gas dynamics laboratory facility (housed in a new one-story specially constructed 32' by 54' building) provides Rock Island Arsenal with such a universal test facility . Operation and maintenance of the facility are responsibilities of the Research and Engineering Laboratory of the Arsenal's Research and Engineering Division.

Equipment within the facility consists of the four basic groups:

1. A compressor and gas supply.

2. A high pressure storage tank with associated valves and nozzles.

3. The model being tested, with positioning table and load sensors.

4. Recording equipment and sequencing controls.

Following study of what type or types of gases and mixtures should be used, a system of oil pumped nitrogen was selected. The system will develop a maximum pressure of 5,000 psi as required in the tests. Because of the inherent hazards involved when working around compressors, compressed gas cylinders, valves, lines, nozzles, and tanks operating at these pressures, rigid safety precautions are applied.

The inlet system to the compressor consists of a bank of 24 nitrogen gas cylinders that feed into a manifold where a reducing valve reduces the pressure to 15 psi. Any appreciable pressure rise actuates a relief valve

set at 100 psi. The gas subsequently goes through a second reducing valve set at 1.5 psi into a surge tank, controlled by a relief orifice set at 5 psi above the reduced pressure. The compressor, which is designed for 10,000 psi, is protected by a switch which will shut it off at a preset pressure.

The high pressure system, up to 5,000 psi, passes the gas from the compressor through an overhead line (1/2 inch heavy walled tubing) into a pressure tank of 40 cu. ft. (water) volume. A check valve prevents any reverse flow. The entire system is protected by a relief valve set at 5,000 psi. A section of this line and fittings was subjected to a test pressure of 30,000 psi with no failure.

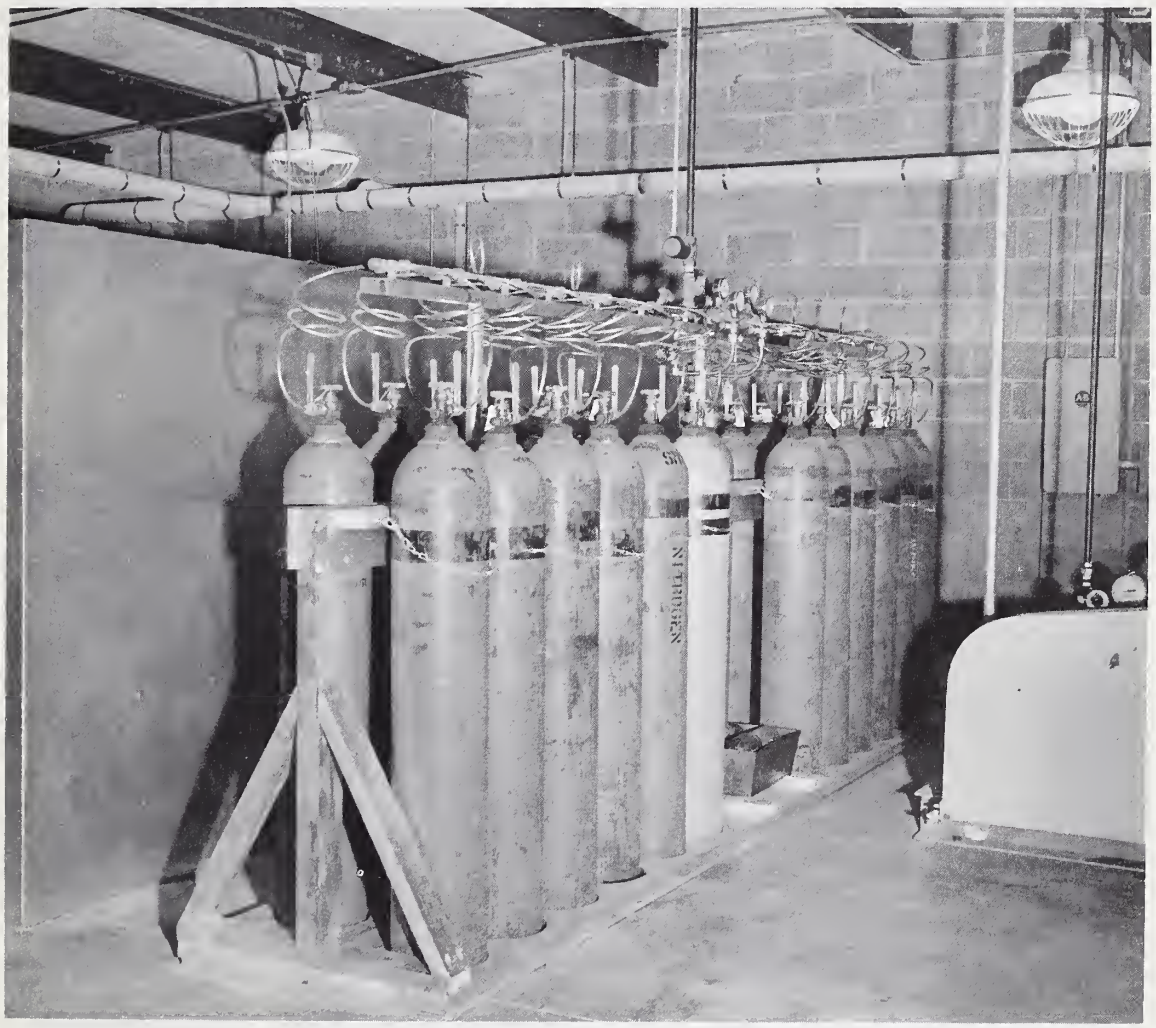
The pressure tank is laminated, because this type tends to tear rather than fragment during a failure. The tank was hydrostatically tested by the manufacturer at 7,500 psi, and a corrosion allowance of one-sixteenth inch on a two-inch wall thickness was established. All parts of the tank were checked and tested in accordance with the applicable regulations established in the Unfired Pressure Vessel Code. A periodic high pressure check of the high pressure components at 5,500 psi, using remotely operated controls, is included in the operating instructions. For this test the relief valve is momentarily set at 5,500 psi, and then reset at 5,000 psi.

The gas is discharged in short bursts through a nozzle and impinges on the model being tested. A quick-opening valve will open a 3 1/2 inch diameter port in .050 seconds. It is pilot-operated from a small reservoir which is protected by a relief valve set at 1,500 psi. To minimize danger to personnel, a motor-operated gate valve has been installed between the quick opening valve and the high pressure tank. The gate valve is kept closed except during a test.

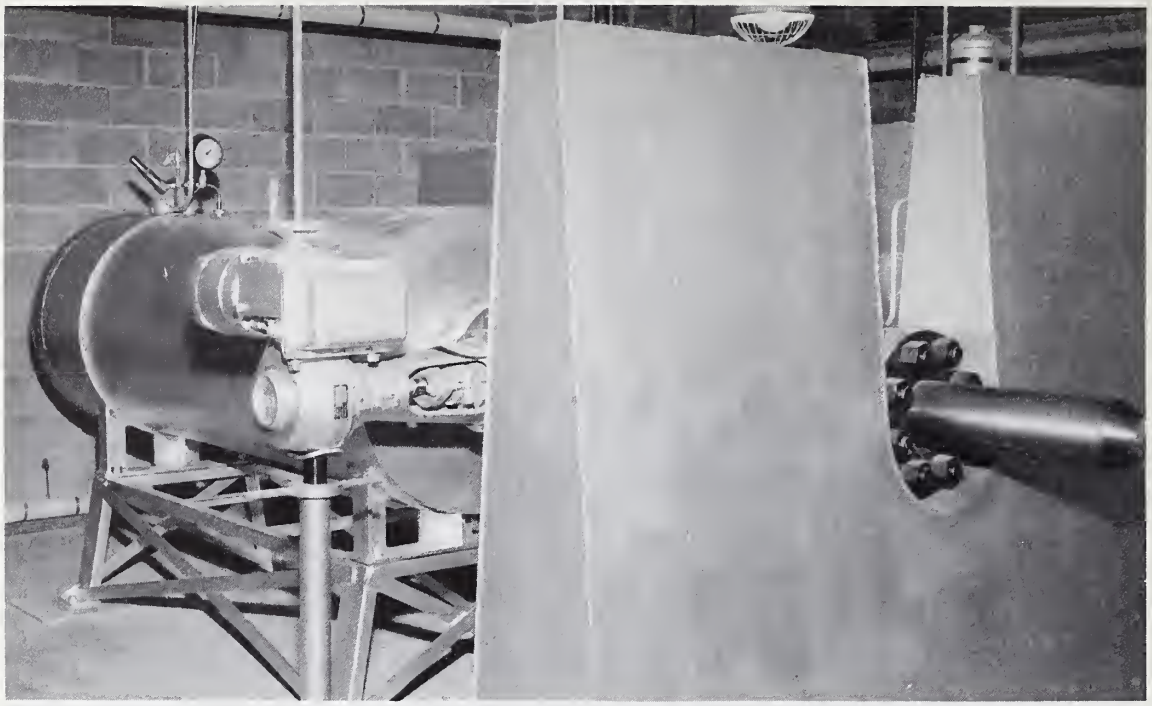
An "L"-shaped barrier of 1/4-inch steel plate for the inner and outer walls, with five cubic yards of sand filling the space between them, separates the pressure tank from the bank of nitrogen gas cylinders, the compressor, and the model test stand.

Sufficient door and louver areas have been provided to prevent excessive pressure build up from the jet blast. When firing is done, personnel open the double doors provided and turn on a flashing red light which signals a test is in process.

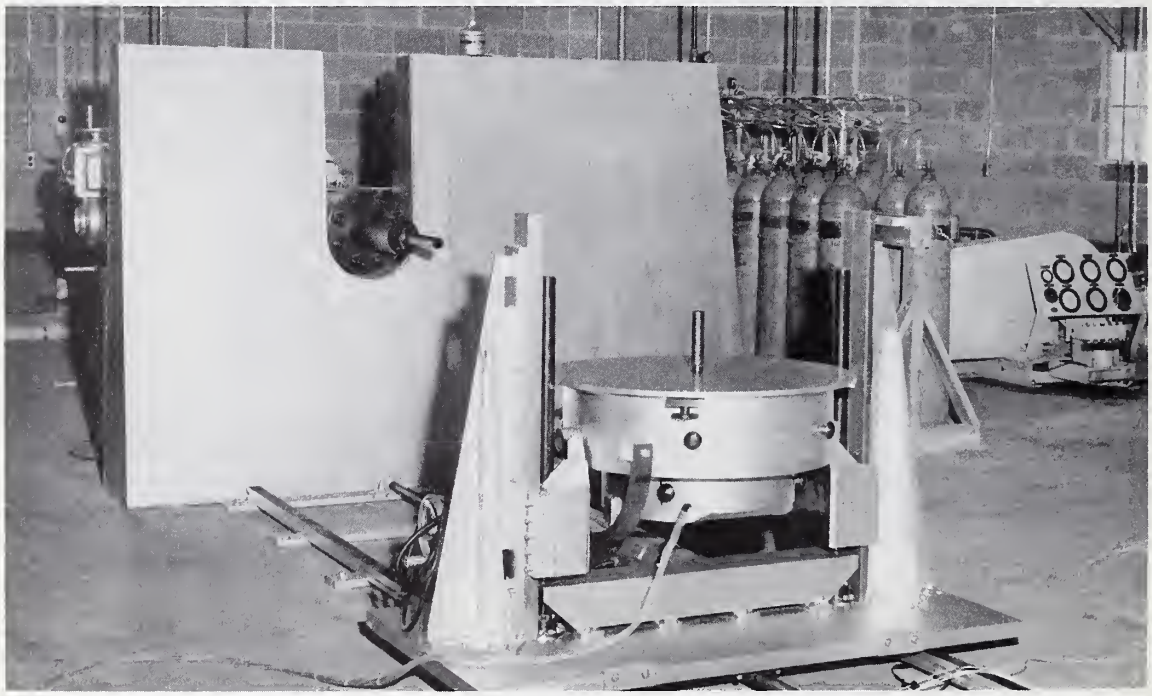
The recording and control equipment is separated from the test room by a cement block wall. The recording system consists of a 36 channel recorder with 16 channels supplied with 600 cps. galvanometers, three power supplies, amplifiers for 16 channels, and interconnecting and shielded cables. The controls include a series of indicator lights to monitor items prior to testing, a firing button to actuate the test, time interval timers, and controls for two high speed movie cameras.



Initial pressure for the Rock Island gas dynamics laboratory test facility is supplied by a bank of 24 nitrogen cylinders.



Picture shows the test facility's high pressure storage tank with its valves, nozzles, and protective barrier.



This picture of the test facility shows (counterclockwise) test facility compressor, nitrogen cylinder bank, protective barrier, exit pressure nozzle, and model test stand.

FLAMMABILITY OF VAPOR AND GASES

Much research has been carried on to assess the hazards associated with the handling, storage, and use of combustible gases, vapors, and liquids. As a part of the general program, limits of flammability and ignition temperatures for the various materials have been investigated and methods developed to minimize the explosion hazards of these materials.

If a combustible gas is added continuously to a given quantity of air, the concentration of the gas increases continuously and eventually reaches a value known as the lower limit of flammability, sometimes called the lower explosive limit. Gas-air mixtures whose concentrations are below the lower limit of flammability are not flammable. If the addition of the combustible gas is continued, the upper limit of flammability, also known as the upper explosive limit, will be reached. Gas-air mixtures whose concentration exceed the upper explosive limit are not flammable. Mixtures are flammable only when their concentrations are between the lower and upper limits of flammability. Continuous addition of air to a known quantity of gas causes the mixture to pass through the same limits of flammability but in the reverse order.

Each combustible gas has its own limits of flammability. However, these limits vary in different atmospheres. When the oxygen necessary for burning of methane gas is furnished by air the limits of flammability are 5 and 14 per cent by volume. When oxygen gas is added to the methane the limits are 5.15 and 60.5 per cent by volume.

In certain cases the limits of flammability of a mixture of two or more gases in air may be calculated from their individual limits by means of the mixture rule. This rule does not hold for all combustible gases and should be used only for gases known to obey it. The equation is as follows:

$$L = \frac{100}{\frac{P_1}{l_1} + \frac{P_2}{l_2} + \ldots \frac{P_n}{l_n}}$$

L=Limit of flammability P_1, $P_2 \ldots P_n$= concentrations of the individual components of the mixture. l_1, $l_2 \ldots l_n$ = Corresponding limits of flammability of the individual components in the mixture.

Vapors of combustible liquids have limits of flammability just as do true gases. The limits for vapors, however, may be expressed in terms of temperature as well as concentration. The relationship between temperature limits and concentration limits is shown below for styrene.

The limits of flammability of styrene vapor in air are 1.10 and 6.10 per cent by volume for the lower and upper limits, respectively. Thus, at a barometric pressure of 746 mm mercury, the lower limit of flammability corresponds to a vapor pressure for styrene of $\frac{746 \times 1.10}{100} = 8.2$mm Hg and the upper limits correspond to a styrene vapor pressure of $\frac{746 \times 6.10}{100} = 45.5$mm Hg.

The vapor-pressure curve for styrene shows that these two vapor pressures correspond to temperatures of 29.3°C and 65.2°C, respectively. When liquid styrene is kept below 29°C, its vapor will not form flammable mixtures with air. Similarly, its vapor will not form flammable mixtures with air at temperatures above 66°C, if the air is saturated with the vapor. If air is not saturated with sytrene vapor, the mixture may contain less than 6.10 per cent styrene and may be flammable.

Unless the gases are well mixed, the average composition of a confined gases mixture is not necessarily an indication of its safety. Under certain conditions little mixing takes place and there may be a zone which is within the limits of flammability. This zone persists until diffusion or agitation renders the mixture uniform.

Limits of flammability for numerous gases and vapors have been published. These values were determined in laboratories and are, therefore, somewhat dependent on conditions of the test. Use of a safety factor in applying such data is advisable.

Increases in pressure and/or temperature widen the limits of flammability. Investigation of a number of commercial solvents indicated that a temperature rise of 100°C lowered the lower limit of flammability 14 to 16 per cent. There is a minimum pressure below which mixtures of a given combustible and air will not explode.

Gases or vapors that absorb heat during their formation liberate the same amount of heat when decomposing. Under certain conditions the decomposition may take place with explosive violence. For example, dry acetylene can explode under a pressure of 6 psig or more, even in the absence of air or oxygen. Similarly, hydrazine vapor, in the absence of air or oxygen, can explode at pressures above 12mm Hg by passage of a suitable spark.

Any gas that can react with evolution of heat is potentially flammable.

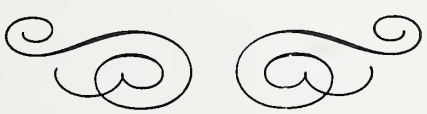
The gaseous products formed by an explosion of combustible gas-air mixtures near the upper limit of flammability contain large amounts of hydrogen and carbon monoxide. Addition of air to these products can form a second explosive mixture which may be ignited by small fires resulting from the first explosion, thus causing a second explosion. Gaseous products formed by explosion of combustible gas-air mixtures near the lower limit of flammability consist chiefly of carbon dioxide, water, and unused air. These products cannot form explosive mixtures with air.

Among the numerous safety measures which may be taken to prevent fires or explosions from combustible gases and vapors are:

1. Maintaining vapor or gas concentrations in air which are appreciably less than the lower limits of flammability.

2. Keeping sources of ignition away from the gases and vapors. Among these sources of ignition are: open flames, static sparks, inductive sparks, electric arcs, hot wires, compression, shock, friction, heated surfaces, and hot flying particles.

3. Substituting nonflammable liquids for flammable liquids whenever feasible.



NEAR TRAGEDY WHEN CHEMOX RESPIRATOR IS MISUSED

Darwin Taras
Headquarters, U. S. Army Materiel Command

Many Army laboratories, manufacturing facilities, and fire departments use self-contained breathing apparatus such as the BM-1307 Chemox respirator. The Chemox respirator permits an individual to work safely in toxic, noxious, and oxygen-deficient atmospheres.

A recent Army report* relates that chance alone narrowly averted a serious accident resulting from the use of a Chemox respirator. It happened this way: Beryllium alloy armor plate was being tested at an AMC Laboratory. A monitor from the U. S. Army Environmental Hygiene Agency (AEHA) was on hand to determine the airborne hazard caused by beryllium. As a precautionary measure, he was outfitted with a BM-1307 Chemox respirator.

Shortly before noon the AEHA monitor inserted a fresh canister into his respirator. He worked less than ten (10) minutes before he quit for lunch.

When he returned afterwards, he put on the same respirator thinking the canister had at least 35 minutes more of useful life. In less than five (5) minutes he was on the ground, unconcious from lack of oxygen. His co-workers probably saved his life by quickly carrying him out of the area and removing the respirator.

The manufacturer's catalog states that the Chemox canister will supply oxygen for one hour. Instructions furnished with the unit warn that the canister has a 3/4 hour service life at hard work before the oxygen supply is depleted. Service life of the Chemox canister should be determined from the moment oxygen generation is started.

Personnel who use the BM-1307 Chemox respirator should be instructed that the respirator cannot be used 45 minutes after the canister is broken unless a fresh canister is inserted.

*AEHA Industrial Hygiene Special Report #4325B 49-63/64.

SAFE MAINTENANCE AND INSPECTION OF TANKS

E. L. Pennington, Maintenance Department
Hercules Powder Company--Radford Army Ammunition Plant

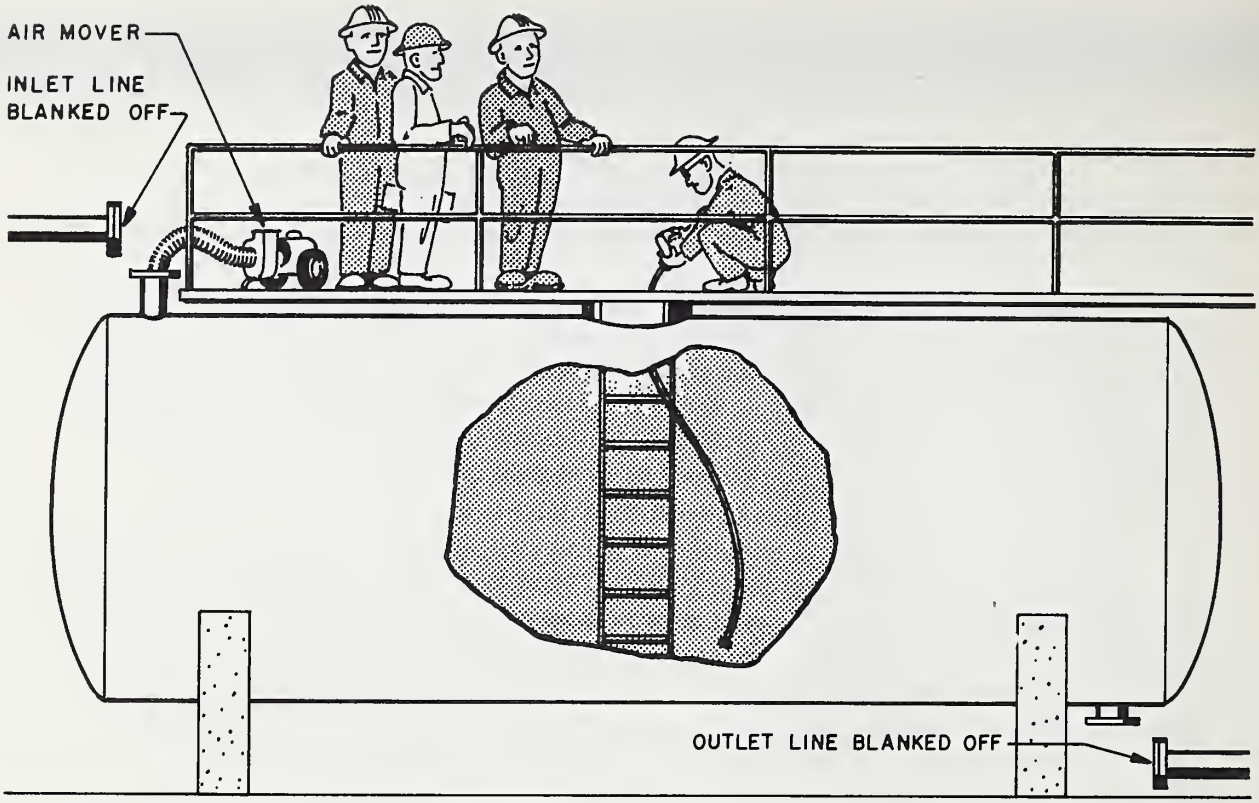
Over the years many men have gone down to their deaths in tanks. We all know that inspection and repairs of tanks and vessels expose maintenance personnel to many potential hazards. To reduce the hazards, Hercules Powder Company, Radford Army Ammunition Plant, has developed a procedure for work in tanks, including a procedure for rescue of a disabled person from a tank.

Before maintenance personnel are permitted to do repair or inspection work, the tank is cleaned of hazardous material. Cleaning operations include the complete removal of the contents of the tank and adjacent lines followed by flushing of the tank, both internally and externally. Operating and maintenance supervisors inspect the tank after cleaning is completed, prior to acceptance for repairs.

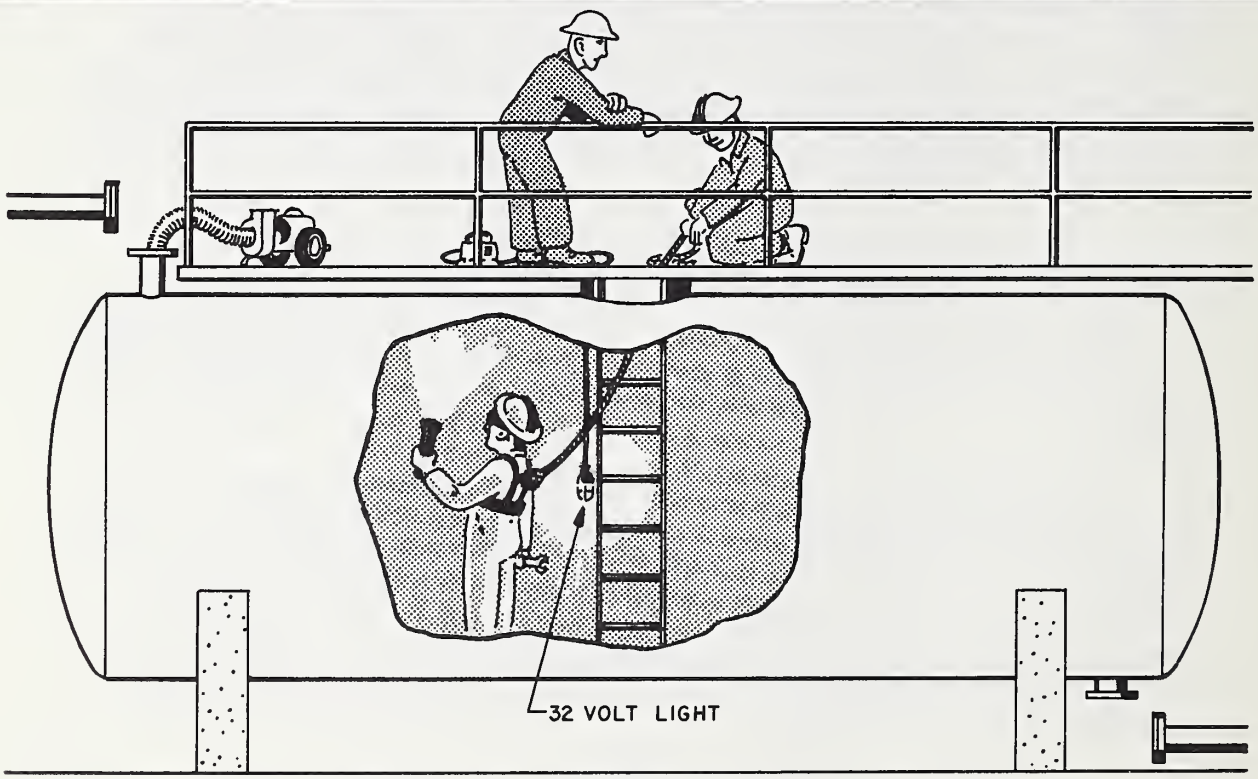
All inlet and outlet lines to the tank are disconnected and blanked off to prevent the flow of liquid into the tank. The tank nozzles remain open. Before blanks are installed, all valves on both inlet and outlet lines are completely closed, all pumps that might force material into the tank are shut down, and the valves and pump controls padlocked.

If one line and pump feed several tanks (some of which remain in active service), the pump is restored to service after blanks have been installed in the lines to the tank being worked on. All internal agitating blades in the tank are padlocked so they cannot be moved and the key remains in the possession of the person entering the tank.

All tanks are considered dangerous until proven otherwise. Before any personnel are permitted to enter a tank, a Safety Engineer checks the air in the tank for the presence of toxic or flammable gases or a deficiency of oxygen. Only when conditions are found to be acceptable are maintenance personnel permitted to enter. Vents and manholes are opened and air movers are used where needed to keep the air fresh.



● CHECKING TANK FOR PROPER SAFETY PRECAUTIONS PRIOR TO PERFORMING WORK



● REPAIRS BEING MADE BY A THREE-MAN TANK REPAIR CREW

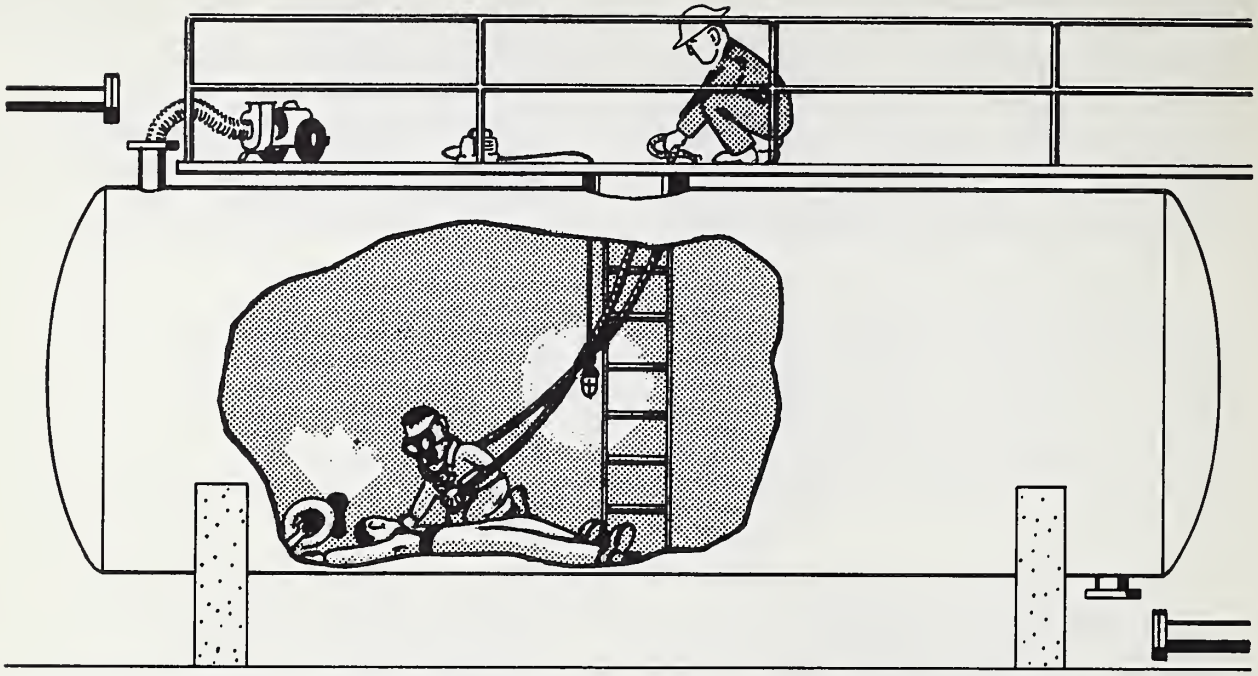
When repairs are made to a tank which has contained acid or caustic material, the tank and connecting lines are flushed free of corrosive material. The pH of the residual liquid is checked to determine the condition of the tank interior. Soda ash is used to neutralize any residual acid to prevent acid drip, and to avoid formation of flammable hydrogen gas because of the action of diluted acid on the metal tank. If welding or other heat producing devices are to be used, the air in the tank must first be checked with a combustible gas indicator.

Personnel working in acid or caustic tanks are required to wear wool or other acid-resistant clothing, eye protection, rubber gloves, and a hard hat with a brim. A water hose is immediately available for use in case of emergency when work is performed in or around acid or caustic tanks. All personnel must check the location of safety showers before repairs are started on the tank.

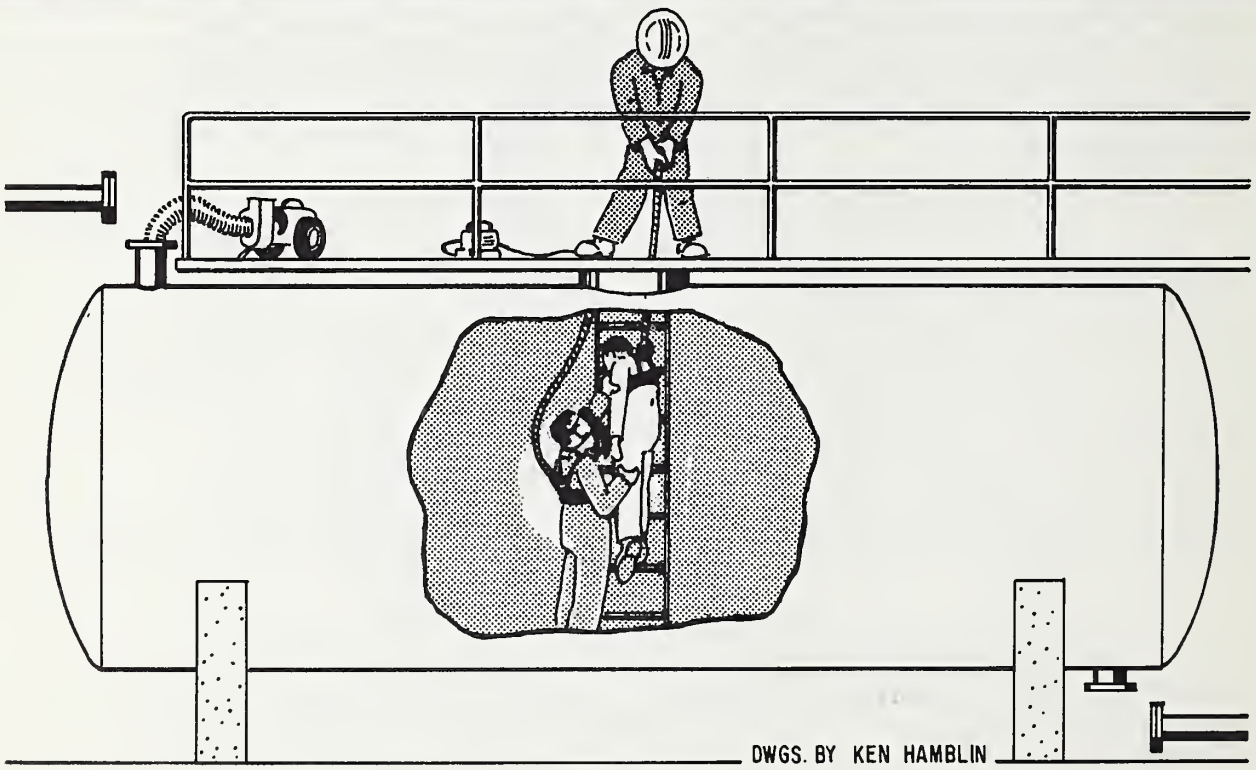
When work is to be done on an ammonia tank, the liquid ammonia is first forced out of the tank. Ammonia vapors are then removed by vacuum. Subsequently, lines are disconnected from the tanks and blanked off. When opening lines, installing blinds, and closing off valves on ammonia tanks, an oxygen-generating or fresh air mask is worn. The tank and connecting lines are flushed thoroughly with water before personnel are permitted to enter the tank. Repairmen wear wool or other resistant clothing, eye protection, rubber gloves, and hard hats with brims. A water hose is immediately available for use in case of an emergency.

If a person becomes disabled, sick, or unconscious in a tank, it is sometimes difficult to remove him through the manhole. For this reason, a special training course in tank rescue procedures was developed. All personnel assigned to tank repair and inspection work are required to have completed the five hour training course. The first two and one-half hours are spent in class, viewing films on tank work and rescue, and learning the use of gas masks and safety harnesses. The last two and one-half hours are spent at the practice tank site where actual demonstration and practice in rescuing an unconscious person from a tank are conducted, using a dummy as the victim.

The procedures described have reduced the hazards associated with tank maintenance and inspection at Radford Army Ammunition Plant. It can now be said with confidence that our men will not go down to their deaths in tanks.



● ONE RESCUE WORKER ENTERS THE TANK WHILE THE OTHER REMAINS ABOVE TO HELP



DWGS. BY KEN HAMBLIN

● THE VICTIM IS REMOVED THROUGH THE MANHOLE

Before any welding, cutting,or riveting is done in a tank, a "Hot Work" permit is issued. Before the permit is issued, the work area is inspected by a member of the Safety Department, and by operating and maintenance supervisors. If they find the work area safe, each signs the permit which authorizes the repair.

If personnel must enter a tank with a contaminated or oxygen-deficient atmosphere, they must wear an oxygen-generating fresh air, or oxygen-demand mask. The safe limit for use of the mask is closely observed, and must always comply with the manufacturer's requirements. Except for emergencies, and then only for short periods, entering a tank is prohibited if contamination of the air inside is suspected.

A safety harness, with a lifeline attached, is worn by each person who enters a tank. In acid or caustic material tanks, a chain lifeline is used. All workers engaged in tank repair or inspection wear eye protection and hard hats. A respirator equipped with a dust filter is worn when working in any tank that has a dust condition.

Two men are stationed outside the tank at all times when a man is inside. One keeps the man inside the tank under observation, and the other is available for rescue work, should it be needed. There is at least one more attendant on the outside than workers on the inside. Under normal conditions no more than two people are inside a tank at the same time.

Extension cords carrying 110 volts or higher are not permitted in the tank. If artificial light is needed, it must be provided by battery-powered lights or 32-volt extension cord type lights. Portable electric hand tools powered by 110-volt circuits are not allowed in the tank; hand powered, pneumatic powered, and battery-powered tools are used. Beryllium-copper or other non-sparking tools are used inside the tank wherever possible.

Special precautions are required in working in tanks that have contained flammable liquids. All flammable material is removed from both the tank and connecting pipelines before repairs are started. The atmosphere of the tank is checked with a combustible gas indicator before any flame or heating device is permitted to be used in the tank. If this check indicates the presence of flammable vapors, the tank atmosphere is further ventilated. All personnel are required to wear flame-proof coveralls.

CURRENT EVENTS

UNALIGNED ELEVATOR FLOOR COSTS FINGERS

A metal shop truck loaded with nine (9) tote boxes of small arms ammunition was to be moved from the third floor of an operating building. To accomplish this, the employee who was assigned the task took a non-automatic freight elevator up to the third. He failed to bring the floor of the elevator level with the building floor.

Since the shop truck was positioned just outside the elevator door, the employee reached out and began to pull it onto the elevator. As one of its swivel wheels dropped to the lower level, the truck tilted. The employee grasped the truck as he made an effort to prevent the load from slipping off. A metal tote box, weighing about 50 pounds, slid from its position on top of the load and caught his right hand inside the truck. Parts of his ring and third fingers were amputated. He was expected to be away from work 14 days.

To prevent similar accidents, the installation instructed its employees to have elevators level with the floor before loading or unloading. Employees were told to push rather than pull loads onto elevators. To reduce the likelihood of tilting, the shop truck was modified to replace the single front and rear swivel wheels with two swivel wheels at each end, and the truck body was permanently attached to its under carriage.

MAKESHIFT SCAFFOLDING SHEDS CARPENTERS

Two carpenters were replacing the roof on a low ramp between two buildings. New rafters were cut and tacked into place at the bottom plate, and preparations were started to nail them to the 2" by 6" ridge row. Scaffold boards that were available at the carpenter shop had not been brought to the work site, and the men devised a makeshift substitute from warped boards that were at hand.

The carpenters mounted their scaffold. One squatted on one side of a rafter that was to be nailed and the second stood on the other side. The squatting carpenter reached toward his apron for his hammer. His movement caused the warped platform boards to twist underfoot. The standing carpenter lost his balance and fell to the concrete floor six feet four inches below. His right hip and pelvis were fractured.

The carpenters, painters, and laborers in the department were called together for a discussion of the accident. Emphasis was placed upon the need for pre-planning jobs and observing safe practice rules, no matter how small the task to be performed. Line supervisors were reminded of their responsibility for insuring the availability on the job site of equipment needed for the safe accomplishment of the work.

POLICE MEET AND CRASH

The soldier had completed seven hours of his day's tour of military police duty. On his way to the new relief he was driving an Army vehicle west down a smooth, straight access road. It was late in a dark, rainy evening, and the car windows were closed. Although the humidity was causing the windshield to fog, the defroster was not being operated.

Coming east on the same road was a privately owned vehicle occupied by four civilian security policemen on their way to work. The two vehicles approached the intersection of a road that led to the south. Without activating his turn signal or making an attempt to stop, the soldier turned left toward the intersecting road. The civilian driver saw the Army vehicle moving toward him on a collision

course and applied his brakes. His car skidded ten feet, but it was too late to avoid a collision. The Army vehicle smashed into the side of the car. No one was injured but the damage to the two vehicles exceeded $500.

A report of survey was initiated to determine pecuniary liability. The soldier was retested to determine his driving ability, and he was warned to grant the right-of-way to approaching vehicles. "Yield right-of-way" stickers were attached to all trip tickets. The accident was given wide publicity among installation personnel, and they were instructed to clear windshields before they moved vehicles.

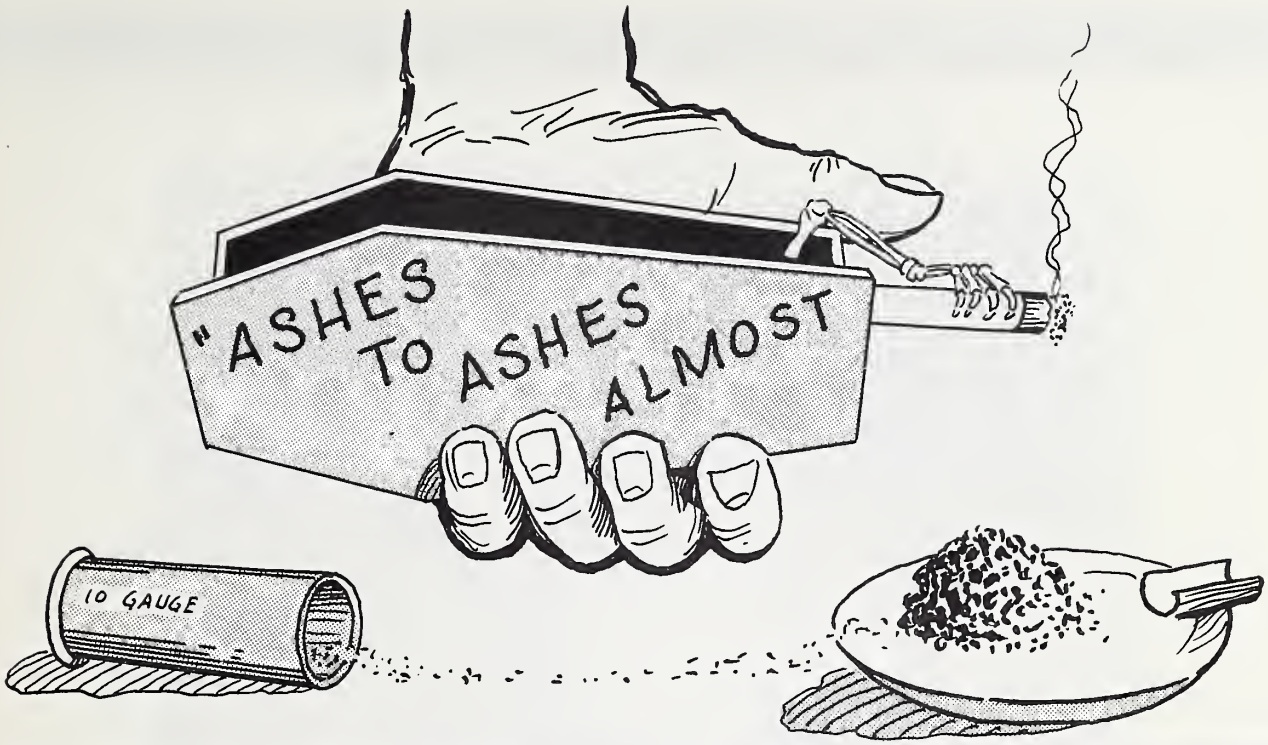
RUNAWAY CRANE TRAPS MAN AT TELEPHONE

A 20-ton motor crane was being backed up an incline between two buildings. As the job site was neared, the approach was found to be blocked by a soft drink truck. The supervisor directing the work ordered the crane stopped until the truck could be moved.

The crane carrier driver set the emergency brake and then dismounted from the cab to unlock the tie-down sling from the boom. The crane operator raised the boom off the resting bar, and the crane began to move down the slope. The carrier driver attempted to re-enter the cab, but the turning wheel prevented him from climbing up.

While the activities involving the crane were in progress, a soldier was making a call in a public telephone booth close by. He was intent on his conversation and was not watching the movement of people outside the cubicle he occupied. The runaway crane moved down the incline, crossed the street and smashed into the telephone booth. The soldier emerged from the wrecked structure shaken but unhurt except for a scratch on the right side of his rib cage. Over $400 damage was done to the telephone company property and about $50 damage to Army property.

The carrier driver and the operator were reprimanded for the poor judgment they had used when one had descended from the cab and the other had raised the boom while the crane was parked on an incline.



AN ASH TRAY FLASHES

A limited supply of the blank 10 gauge shotgun shells used for firing a field piece at Retreat was kept at the main gate house. During a quiet period while he was on guard duty at the gate a young soldier examined the ammunition. To satisfy his curiosity about its construction he removed the paper plug from one of the rounds and poured out the contents. His interest satisfied, he attempted to reassemble the shell. He failed to get it back together, and he disposed of the black powder temporarily by dumping it in an ash tray.

Later in the shift the soldier had occasion to discard a cigarette. Without thought of any hazard, he turned to the ash tray to put out the lighted tip. The loose black powder ignited, and the flame flared into his face. The man received first and second degree burns on his cheeks and nose and was away from duty for about two weeks.

Instructions on the proper handling of ammunition were provided for all physical security personnel at the installation.

AMC SAFETY SCHOOL GOES TO PUPILS

The AMC Safety School takes its instruction to its pupils in the field, as well as presenting it in scheduled classes at the AMC Field Safety Agency, Charlestown, Indiana. In the photograph above, Colonel Thomas W. Cooke, Commanding Officer, U. S. Army Missile Support Command, is shown as he opened a recent field training course at Redstone Arsenal, Alabama. In a five-day period four members of the AMC Safety School staff conducted two 15-hour courses that were attended by 160 supervisors. Army military and civilian and contractor personnel received instruction in the "Safety Management Course for Supervisors".

Subjects taught during the course included psychological approach to safety; accident investigation, analysis, and reporting; safety standards, inspection, promotion, and education; safety committee activity; safety engineering; motor vehicle safety; and principles of enforcement.

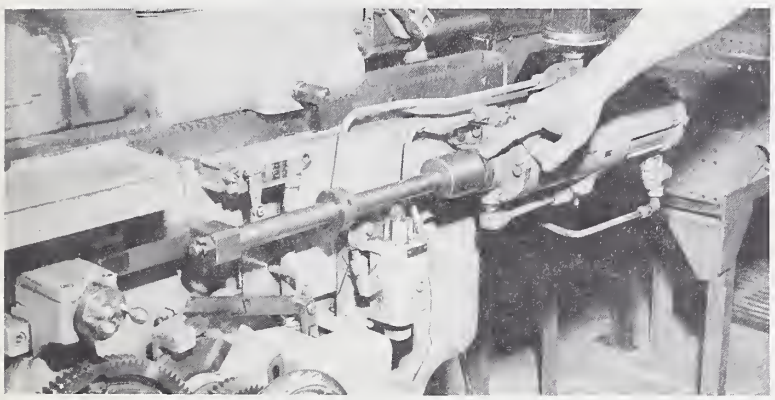
SPECIAL TYPE MACHINE GUARDING

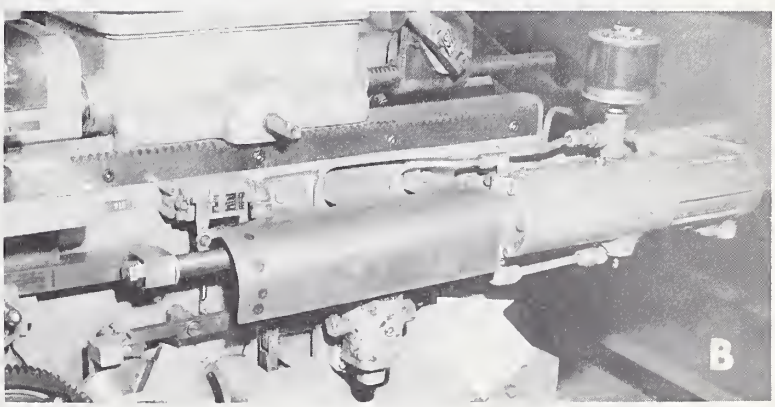
Frank Lesniewski
Safety Officer, Rock Island Arsenal

Thread grinding machines generally are not considered dangerous, and a guard is not provided by the manufacturer. The Rock Island Arsenal recognized the hazard of the crushing operation set up between collar and the cylinder flange. To eliminate the danger, a guard was built and installed over the hazardous area to prevent access to the danger zone during operation.

An unguarded thread grinding machine is shown in Photo A, with the worker's finger above a nip point. Photo B shows the same machine with the guard installed.

Machine guards are of primary importance in eliminating machine accidents, but guards alone are not enough. The employee who operates a machine must be alert for all possible hazards.





LABORATORY OVEN SAFETY

Thomas P. Browne, Supervisory Safety Engineer
U. S. Army Missile Support Command

Laboratory ovens, test ovens, processing ovens, and industrial ovens are all too often the causative agents of accidents that result in serious injuries to personnel and extensive damage to property. Analysis of reports of these accidents reveals that most of them are caused by conditions that should have been found and corrected through adequate supervision, inspection, and periodic maintenance.

The problem of laboratory oven safety is growing because of the increased requirements for research and development operations involving unknown chemical compositions.

To assure that laboratory oven operations comply with established safety standards, a planned program should be started as soon as possible and continued until all requirements based upon oven safety principles

have been accomplished. Listed below are some of the items that should be considered if you are to achieve safe and efficient operation of a laboratory oven.

1. Ovens should not be used for storing chemicals or explosives unless required by analytical procedure, and then only under strict and periodic surveillance.

2. An oven should not be exposed to the hazard of an explosion in a neighboring oven.

3. Preference should be given to hot water or steam instead of electricity as the heating agent.

4. Ovens should be provided with dual automatic controls.

5. The quantity of chemicals or explosives in ovens should be maintained at a minimum by prompt removal after drying, and by using test samples no larger than required for accuracy.

6. Ovens should be cleaned periodically with appropriate desensitizing agents to remove all explosives contamination.

7. Ovens should be labeled for the drying of specific hazardous chemicals or explosives only, with the maximum operating temperature and/or vacuum clearly specified.

8. All metal parts of ovens should be bonded together for electrical continuity and then properly grounded for dissipation of electrostatic charge.

9. Barricades should be provided for the protection of personnel when ovens contain explosives or hazardous chemicals.

10. Combustible and other hazardous materials should not be located in the same cubicle with the oven.

11. Ovens should be so located that personnel will not be exposed if ignition occurs and hot gases are vented through opened doors.

12. Nonferrous materials should be used where sparking is a hazard.

13. The hardware and other metal parts of ovens should be such that they will not react with chemicals used in or around the oven to form substances that are more sensitive to heat, friction, and impact than the original materials.

14. Laboratory ovens of all types should be equipped with a device which will hold the doors in a closed position, yet allow quick venting in case of ignition within the oven.

15. Ovens operating at elevated temperatures should be equipped with visual or audible warning devices that will signal the operator if the oven temperature becomes excessive.

16. Ovens should be provided with a standard type thermometer and a recording thermometer (temperature recorder.) The two should be graduated in the same scale.

17. Care should be taken during oven loading operations to avoid:

a. Overloading the unit.

b. Shielding the temperature control sensing elements.

c. Blocking the air flow passages.

18. Before a temperature conditioning test is begun, the safety margin between operating temperature and the autoignition temperature of the materials involved should be determined.

These, and other engineering and operational changes that may be necessary to meet specific situations, are essential steps toward the prevention of fires and explosions in laboratory ovens.

While engineering will go a long way toward achieving safety in the operation of laboratory ovens, the elements of education and enforcement must be added. Personnel require education on the how and why of compliance with approved laboratory rules. These rules must be fairly and firmly enforced. This combination of engineering, education, and enforcement can make laboratory oven operations safe.

Paragraph 1621, AMCR 385-224, prescribes safety precautions which must be observed when maintaining or repairing equipment which has been exposed to explosives.

Dependent upon the equipment involved and the nature of repairs to be effected, repairs may be performed with equipment "in place" or the equipment may be transferred to an inert shops area for repair. Both circumstances introduce definite hazards from explosion and fire unless precautions are taken.

In connection with the problem of exposure of maintenancemen to hidden explosive hazards, it is worth repeating that the residue of nitrocellulose, high explosives, and solid propellants remaining in hidden places in equipment have sufficient force to amputate hands and arms or even kill if accidentally initiated from the heat of welding and brazing torches and soldering irons or from the blow of a hammer. Such accidents have happened.

Where repairs are to be made on equipment "in place" the potential hazard is obvious since bolts and nuts, screwed fittings, and flanges provide openings of sufficient size to harbor explosives in quantities large enough to kill or seriously injure personnel and in some instances initiate a larger and more disastrous explosion.

Established procedures must be in force to assure that contamination is completely removed prior to transferring the equipment to an inert shops area. For making repairs and adjustments to explosives processing equipment or other items "in place", it is essential that all explosives contamination be removed or neutralized by competent personnel and, in addition, that the men making the repairs be instructed regarding the potential hazards.

Time will not be wasted and it has been accepted practice in the past for such proposed maintenance and repair operations to be the subject of joint consideration and approval by competent personnel of the safety section, explosives section, and maintenance section prior to accomplishing the work.

WHAT TO WEAR
WHEN TO WEAR IT

HATS, CAPS HELMETS

1 SPARKS	2 HOT MATERIALS	3 HEAT	4 HOT LIQUIDS	5 MOISTURE	6 ACIDS & ALKALI	7 SLIPS & FALLS	8 FALLING OBJECTS	9 FLYING PARTICLES	10 ELECTRIC SHOCK	11 CUTS & ABRASION	12 DERMATITIS	13 EXPLOSIVES	14 MACHINERY	
X	X	X												ASBESTOS
			X	X	X				X		X			PLASTIC-RUBBER
X		X									X		X	COTTON-WOOL
							X	X		X				METAL
X							X	X	X	X				PLASTIC

COATS, APRONS WAIST PROTECTION

1	2	3	4	5	6	7	8	9	10	11	12	13	14	
X	X	X												ASBESTOS
X	X		X					X		X				CHROME LEATHER
			X	X	X				X		X		X	PLASTIC
			X	X	X				X		X		X	RUBBER
								X		X			X	CANVAS-FIBER
					X									CHEMICAL RESISTANT
			X											REFLECTIVE FABRIC

SLEEVES WRISTLETS

1	2	3	4	5	6	7	8	9	10	11	12	13	14	
X	X	X												ASBESTOS
X	X		X					X		X				CHROME LEATHER
X	X	X						X					X	FLAMEPROOFED DUCK
			X	X	X						X			PLASTIC
			X	X	X				X		X			RUBBER
					X									CHEMICAL RESISTANT
			X											REFLECTIVE FABRIC

GLOVES, MITTENS HAND PADS FINGER GUARDS

1	2	3	4	5	6	7	8	9	10	11	12	13	14	
X	X	X												ASBESTOS
X	X		X					X		X				CHROME LEATHER
			X	X	X				X		X			RUBBER
			X	X	X						X			PLASTIC-RUBBER COATED FABRIC
										X				METAL MESH
										X				COTTON-CANVAS

PANTS, KNEE PADS LEGGINGS

1	2	3	4	5	6	7	8	9	10	11	12	13	14	
X	X	X												ASBESTOS
X	X		X					X		X				CHROME LEATHER
X	X	X						X					X	FLAMEPROOFED DUCK
X							X	X		X			X	FIBER-METAL
			X	X	X						X			PLASTIC
			X	X	X				X		X			RUBBER
					X									CHEMICAL RESISTANT
			X											REFLECTIVE FABRIC

SHOES, BOOTS

1	2	3	4	5	6	7	8	9	10	11	12	13	14	
							X			X			X	STEEL TOE CAPS
				X		X								NON-SKID SHOES
	X	X	X	X	X	X				X				WOODEN SOLES
X	X	X	X											CHROME LEATHER
			X	X	X				X		X			RUBBER
												X		CONDUCTIVE RUBBER

Safety Division, Picatinny Arsenal

In an attempt to cope with the mounting tide of vehicular accidents, Picatinny Arsenal has purchased a testing device for analysis of driver habits. Since its installation, civilian and military drivers have been tested in the Arsenal driving school by factory-trained Arsenal personnel with startling results.

The testing system consists of four units: the auto, that is reminiscent of the Model A roadster; a motion picture projector; a screen; and a reaction recorder. The student seats himself behind the wheel and operates a conventional hand brake, clutch, foot brake, accelerator, and gear shift. Mounted on the dash is a gas gage, speedometer, generator gage, and ignition lock. A projector mounted above and behind the driver projects a ten-minute color, sound movie on the screen, giving the student an illusion of actual motion while driving along a suburban area road.

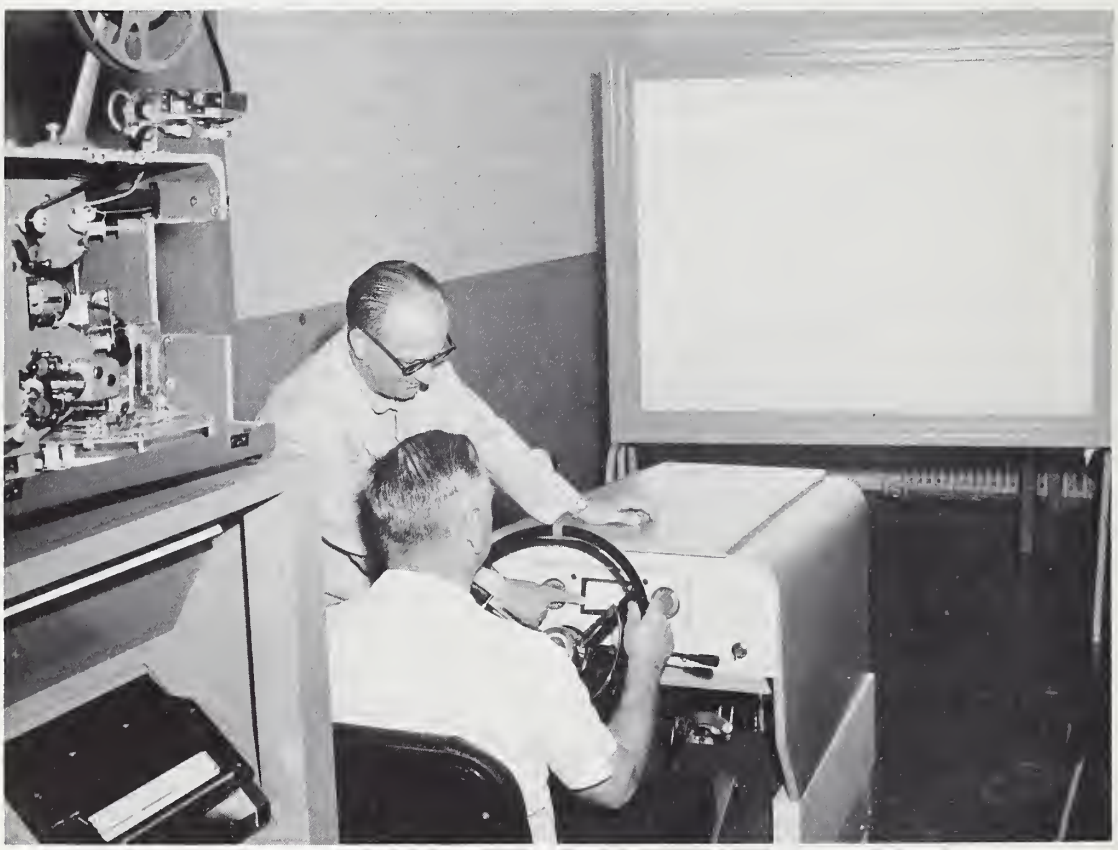
The student follows the directions of the narrator for a short test drive. He is then on his own to start and pull out into traffic for the remaining tests. Ten different situations are flashed on the screen, and the speed is specified by printed direction. As the situation develops the driver must react by shifting, accelerating or decelerating, applying the foot brake, using directional signals, and steering. If he reacts correctly to the visible situation and avoids a collision, the screen becomes momentarily blank before the test continues. If he reacts too slowly and fails to do the right thing, a startling starburst makes him realize that a crash has occurred.

The reaction recorder, synchronized to the film, records the driver's reactions on a continuous scoring graph similar to an electrocardiograph and plots the rate of speed, degree of steering, braking power, use of directional signals, and the results. While the student driver knows the results of his reactions visually, the recorder provides a printed graph that can be analyzed and annotated. It can be given to the student or filed.

The realism of the operation is so startling that students are visibly impressed. The average driver will crash three times in the ten situations depicted on the screen. Soon after it was installed the device was tested by a New Jersey state trooper. After he had crashed four times the officer made the wry observation that he should give himself a ticket for careless driving.

At Picatinny Arsenal every vehicle operator who requires refresher or remedial training in vehicular operation must undergo a course of instruction which includes a session on the machine.

The manufacturer is filming more sequences to cover other aspects of driving. In order to keep abreast of current traffic problems, the Arsenal will secure these when they become available.



A student prepares to start on test drive at Picatinny Arsenal. Frank Reilly, an Arsenal Safety Officer, gives instruction on the operation of the testing device.

DO YOU KNOW ?

Here are ten questions that will test your knowledge of information you will need under different circumstances. The answers to all of them are available in AMCR 385-224. How many can you answer before referring to the regulation? The correct answers and references appear on pages **34** and **35**

1. What maximum exterior surface temperature is permitted when steam or hot water pipes are in contact with wood, paper, or other combustible materials?

   Answer:

   Reference:

2. What is the separation requirement for maintenance and tool rooms from explosives in an operating line?

   Answer:

   Reference:

3. Are operational shields required for removal of base plugs from loaded projectiles?

   Answer:

   Reference:

4. What is the maximum rotational speed permitted for equipment used in field ammunition operations?

   Answer:

   Reference:

5. What safety device must be installed in steam lines used in explosive melting to prevent a build-up of pressure?

   Answer:

   Reference:

6. What is a weep hole in a valve?

   Answer:

   Reference:

7. What agencies approve respiratory protective devices that may be used in dusty or toxic atmospheres?

   Answer:

   Reference:

8. What is a volatile flammable liquid, as defined by AMCR 385-224?

   Answer:

   Reference:

9. What class of electrical equipment is utilized in atmospheres that contain magnesium dust?

   Answer:

   Reference:

10. What operator protection is required when foreign or other ammunition of uncertain design is tampered with?

    Answer:

    Reference:

NEW HELMET LINER PROTECTS COMBAT SOLDIER

A new, tougher helmet liner that will increase ballistic protection for the combat soldier when worn with the standard steel helmet has been developed by the Natick Laboratories of the U. S. Army Materiel Command.

The new liner, shown at right in the picture, is made of laminated nylon material and is produced in the same shape and size as the older resin-impregnated cotton duck model. It differs in having an improved suspension system which stabilizes the liner on the head through the use of an adjustable suspension band and nape strap. The chinstrap has been eliminated.

32. Here are the answers to the questions on pages 31 and All questions were based on information contained in AMCR 385-224. A reference to the pertinent paragraph follows each answer.

1. 160°F. (71°C)

   Reference: Paragraph 523, AMCR 385-224.

2. Intraline distance should be provided. When intraline distance separation cannot be provided, protection equivalent to that provided by a substantial dividing wall must be provided.

   Reference: Paragraph 1621i, AMCR 385-224.

3. Yes.

   Reference: Paragraph 2503b(2), AMCR 385-224.

4. For drilling exposed explosives 75 revolutions per minute is the maximum. For cleaning metal parts seated in explosives 125 RPM is the maximum.

   Reference: Paragraph 2512, AMCR 385-224.

5. Water legs shall be installed in these steam lines where pressure does not exceed 5 psi. Where steam pressures exceed 5 psi, a counter balance, sealed to prevent tampering, or a rupture disc should be used in addition to installed pressure relief valves if water legs are impracticable.

   Reference: Paragraph 2604b, AMCR 385-224.

6. A weep hole is a small hole which is drilled in the bonnet of Hills-McCanna and Saunders type valves. These valves are positioned so that if the diaphram leaks the fluid will drain from the valve by gravity flow.

   Reference: Paragraph 2606b, AMCR 385-224.

7. The United States Bureau of Mines or the Army Environmental Hygiene Agency.

   Reference: Paragraph 1009, AMCR 385-224.

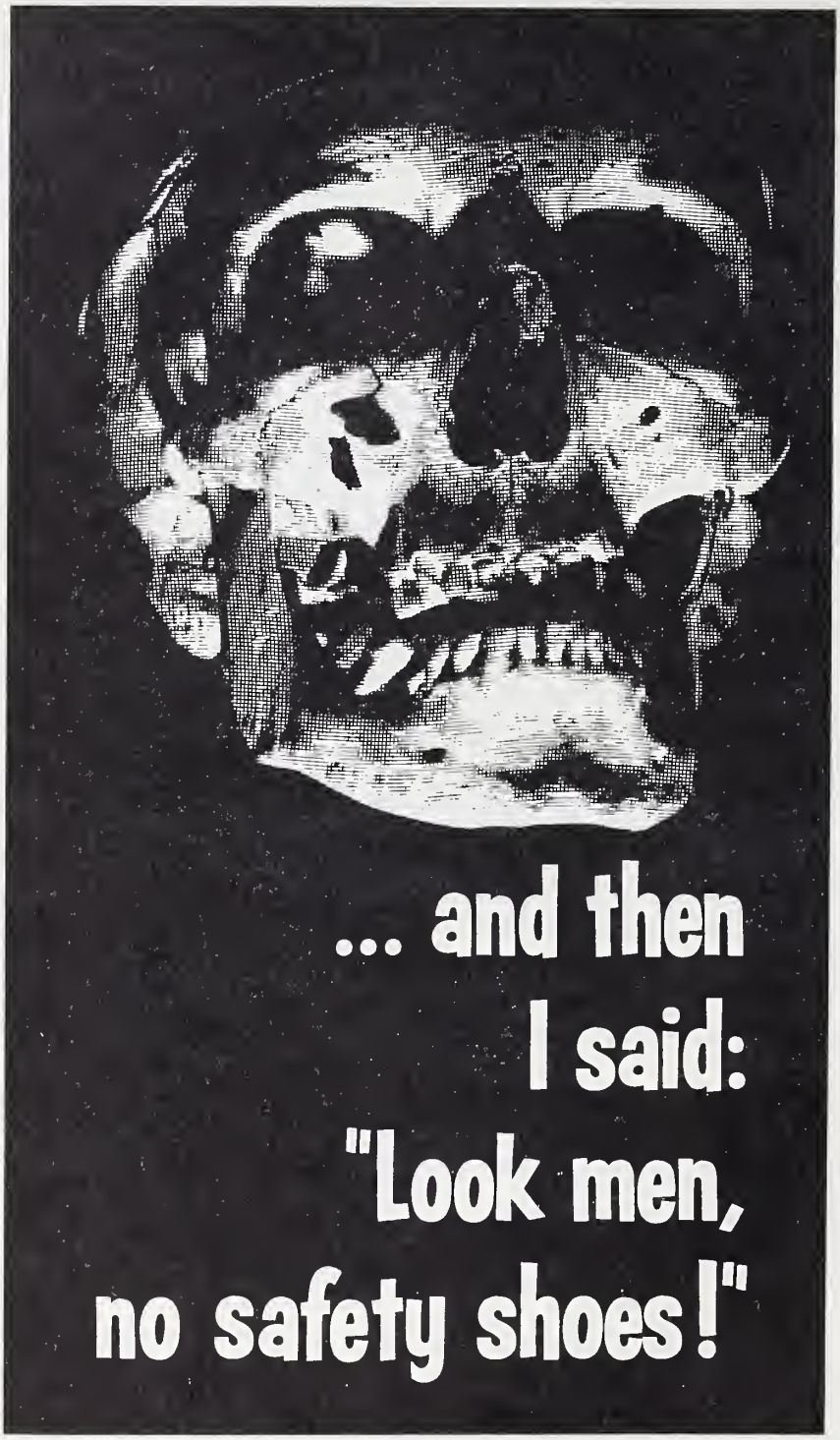
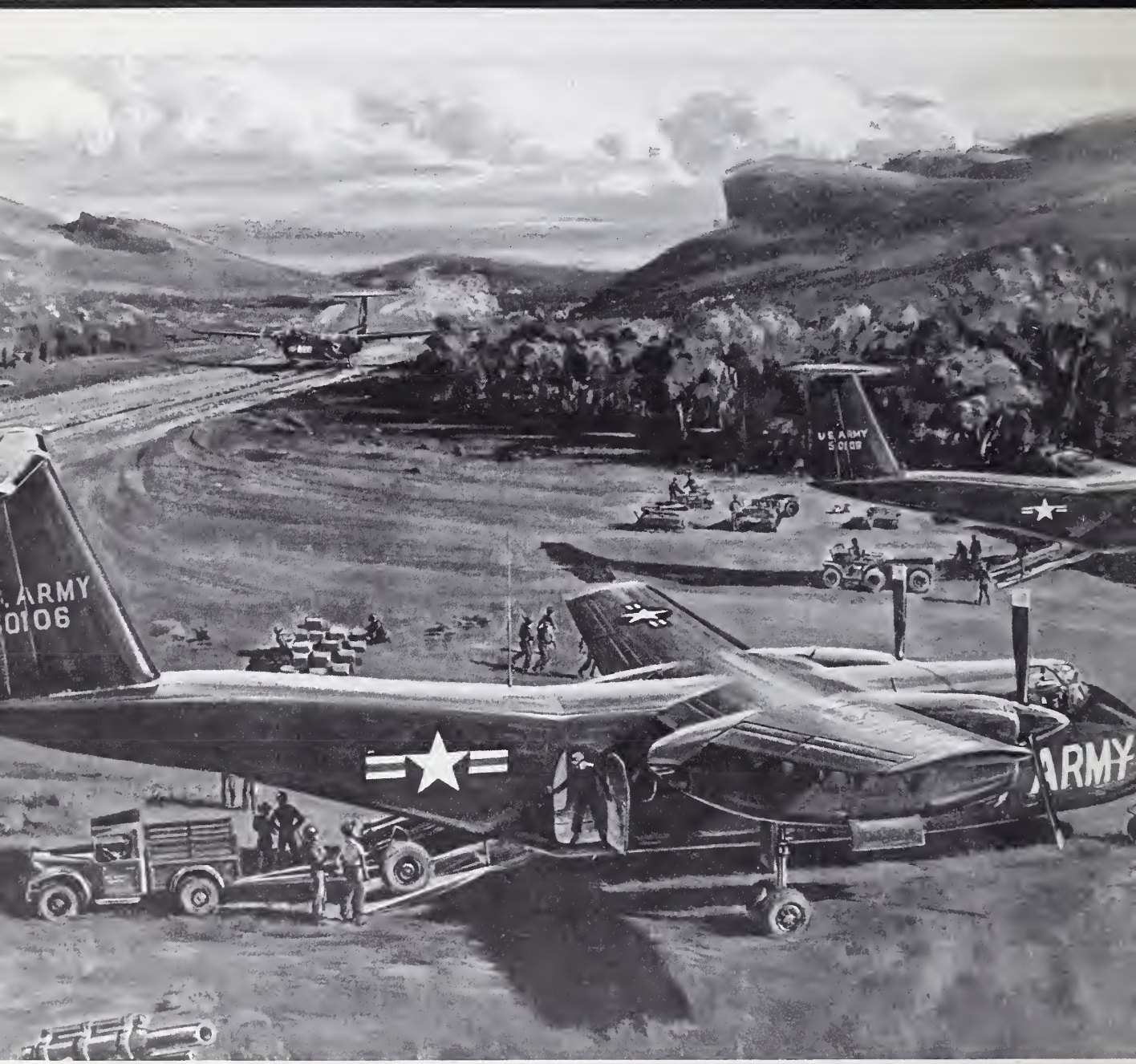
8. Any flammable liquid the vapor of which can be ignited at or below temperatures of 100°F. (closed cup flash point) is a volatile flammable liquid.

9. Class II, Group E, electrical equipment is used in atmospheres that contain magnesium dust.

   Reference: Paragraph 603e(4)(a), AMCR 385-224.

10. The operator must be adequately shielded.

    Reference: Paragraph 2503b, AMCR 385-224.


... and then
I said:
"Look men,
no safety shoes!"

UNIVERSITY OF FLORIDA
3 1262 09304 9491
FLARE